

California High Speed Rail Authority

# Irrigation Systems

*"Will the delivery of agricultural water be impacted by the high-speed train?"*

Agricultural Working Group White Paper

Approved: 7/2/2012

## BACKGROUND

The California High Speed Rail Authority (CHSRA) proposes to connect the large population centers in California and thus establish a new railway in the San Joaquin Valley. The new rail alignment is proposed to be constructed either on existing farmland or adjacent to, where such land lies between urban and commercial parcels in the Valley. Most, if not all, of the Valley counties through which the railway is proposed to travel have Right-To-Farm Ordinances which make reference to “customary and/or traditional” agricultural practices. The proposed project has raised questions and concerns regarding its impact on many established and customary agricultural practices and consequent potential imposition of new regulatory restrictions. Customary agricultural practices found in the Valley are as varied as is the diversity of agricultural products and commodities produced. The San Joaquin Valley as a natural resource is unique to the state, the nation, and arguably the world by the quality and quantity in the diversity of its agriculture.

The CHSRA has created a “technical” agricultural working group to assist the CHSRA in responding to the more technically oriented questions/concerns that have been asked regarding impacts to agriculture resulting from activities during the construction phase and the daily operation of the High Speed Train. The agricultural working group membership is comprised of members in possession of technical expertise in various categories of agriculture activities and infrastructure.

The San Joaquin Valley climate is naturally very dry, yet this region has become one of the most productive and important agricultural assets in the world. Water resources were developed in stages over the past 130 years to store and distribute the Sierra snowpack runoff to property owners by building canals and ditches, to provide surface storage for flood control and use throughout the year, to provide ground water during drought periods, and to convey water long distances to where it is needed, when it is needed. Additional facilities have been constructed for drainage, capture and treatment to improve efficiency, reduce environmental impacts and increase reliability.

Today, agricultural production across the San Joaquin Valley depends upon highly developed, engineered water systems that can respond to changing weather patterns and increasing demand from a growing population. Farmers have collectively and individually made huge investments in irrigation systems to provide safe, reliable and efficient use of a vital resource.

The drafting of this white paper includes information received through consultation with irrigation districts, conservation districts, water supply districts, ditch companies, and flood control district.

## ISSUE

There is great concern that the HST project will disrupt the delivery of agricultural water by impacting conveyance facilities across large irrigation districts and on individual farms during both operations and the construction process. Specific concerns range from the elimination of wells, interruption of service during a growing season, conveyance across the HST right of way, permanently creating operational

impacts by changing the way irrigation water is delivered, and impeding inspection of and access to conveyance facilities, and hindering the routine or emergency maintenance of canals and ditches.

## DISCUSSION

### Design and Construction

The replacement, modification, or addition of facilities associated with irrigation systems must be separated into two classifications and each handled with a distinct process.

**The first process** will address the large scale water conveyance systems owned and operated by Irrigation Districts, Water Storage Districts, Water Conservation Districts, and Ditch Companies (water agencies) that are easily identified within the project footprint and have been documented during the design process. This process will also address natural channels that cross the HST alignment. In most cases, these conveyance systems cross under the at-grade HST alignment. Existing canals, ditches, pipelines, and channels could be accommodated with the use of box culverts, pipelines, structures, or siphons.

These features will be designed by the project designers to handle design flows, prevent erosion and scour, allow inspection and maintenance, meet environmental mandates, and protect the integrity of the HST alignment. Some realignment of the conveyance systems could be incorporated to achieve perpendicular crossings or satisfy some other site-specific condition.

Where water agency systems run parallel to the HST alignment and would fall within the footprint of the project, the standard solution is to acquire land required to relocate the parallel segments outside and parallel to the permanent HST right-of-way, construct the new canal segment with replacement turnouts, tie-in the new segment during an outage period, and transfer the land and the facility to the water agency when the facility is rebuilt. It is vital to the property owners that operating turnouts on the existing canals remain in service during the construction period which could also require temporary pumps and conduits. Other features such as wells and ponding/storage areas may likewise need relocation and must be engineered to function and staged to allow operations to continue during construction.

Each water agency has its own preference for lined or unlined canals and ditches. This is usually dependent upon the need or desire to recharge the groundwater. While lining generally limits erosion or “wash-ins”, it can also result in erosion or rodent infestations behind the lining. Rip-rap is another means to limit erosion (often on the outside of bends in canals and ditches), it too can create problems by preventing access to canal banks. These preferences will be documented in a Master Agreement specific to each water agency. Conveyance system modifications or relocations typically need to be designed to limit or reduce pumping energy inputs, minimize maintenance costs, and preserve operational integrity. These Master Agreements should also address future planned irrigation projects and in cooperation with the water agencies result in improved efficiencies.

Natural river and stream channels are often an important part of the water agencies' conveyance systems. Because of their nature, modifications to channels and impacts to flows need to be carefully coordinated with both the water agencies and a number of resource agencies. Standard bridge structures are generally used to cross natural channels to reduce or avoid impacts.

Based on discussions with water and resource agencies, the HST designers will complete the 30% designs for the water conveyance features mentioned above and then the designs will be completed by the design consultants teaming with the design/build contractors. While water and resource agencies generally lack resources to design such features, they ask that the project designers use the agency adopted engineering standards and that they have the opportunity to review design drawings at each stage of design. They also want to be part of the construction inspection function for conveyance systems being modified by the project design team. All aspects of the design and construction process with water agencies will be covered by a negotiated Master Agreement such that all parties are clear on the design standards used, the inspection required, operational considerations required during construction and responsibilities for the future infrastructure.

**The second process** to address irrigation system impacts will be applied to all of the individual systems owned and operated by each property owner. They usually consist of a mix of wells, pumps, standpipes, ditches, mains, pipes, laterals, valves, filters, drip lines, storage facilities, and mobile systems. These impacts will be part of the negotiations that accompany the right-of-way acquisition process. Only after the Final EIR/EIS is approved, can HST right-of-way agents approach each property owner and begin to identify improvements to each parcel. As necessary, irrigation designers/consultants will be brought into the discussions to determine appropriate irrigation solutions. Clearly, each case will be unique and will involve a different mix of relocations, replacements, realignments, and other modifications. When large agricultural parcels, or sets of parcels, are split into separate, viable units by the HST alignment, individual irrigation systems may require significant modifications. For many dairies disposing of their waste water by spreading it on other lands or re-using it to irrigate other crops is a common practice. Dairy operators that use their waste water to irrigate other crops and need to have their conveyance facilities re-routed would also be within this process. Irrigation systems will be allowed to cross the HST right of way, but must meet specific design standards to ensure HST operation and serviceability. The design standards to do so will vary on the irrigation system and could, for example, be a larger cased opening which extends across the HST right of way, allowing the placement of an irrigation line. In other cases, such as surface irrigation systems, additions to water supply facilities would be needed to maintain gravity flow for served reconfigured fields; added headwater and tailwater facilities (usually ditches) on the separate parcels, and additional space to access those facilities for operation. In some cases, additions to water supply facilities (usually ditches or pipelines), extensions of supply facilities across the HST alignment, additions to tailwater facilities (usually ditches) on separated parcels, and additional space to access the facilities by vehicle will be required to maintain gravity flow and serve reconfigured fields. There may be inefficiencies of operating systems serving severed parcels that will increase costs to the property owner. New wells and additional power lines may be required. Individual negotiations within the right of way acquisition process are intended to resolve redesign, productivity,

and reimbursement issues. The planning, design, and construction of these facilities are generally best managed by the individual property owner but are also subject to the right of way acquisition process.

### Operations

Key principles emphasized by agencies and private property owners include maintaining continuous delivery of water to all users as required and avoiding permanent impairment of delivery operations. Careful timing of work of outages, temporary conveyance capability, and quick transitions to relocate or replacement of facilities can minimize disruptions. Designers must take into account operational activities and demands on the systems while designing system modifications. The Master Agreements document such requirements and are conditions the design build contractor must comply with.

Daily delivery operations and routine inspections require light vehicle access at all times to all segments of conveyance systems. Extensive surveillance of conveyance systems is critical to protecting facilities and distributing water flows accurately. Provisions for emergency operations require coordination for assurance of access to protect life and property.

The siting of trash removal facilities during design requires close coordination to ensure that trash build-up can be detected during all weather conditions and corrected from suitable access points.

### Maintenance and Repair

The most common maintenance and repair tasks along an open canal or ditch would include cleaning out and grading the bottom and side slopes of the facility. On the banks of the waterway, removing vegetation, shaping, grading, and compacting the soil would be common activities. To do these activities, access to both banks is required and access to the bottom of the dewatered waterway is desirable. Maintenance and repair of structural and mechanical components would require much more specialized construction techniques. Major work on a large diameter pipeline or in-water work on a diversion structure would be examples of the most complex work.

All water and resource agencies are particularly concerned by restricted access to canals and ditches for the purposes of repair and maintenance activities. Generally, routine maintenance activities are scheduled on an annual basis at a time when many waterways can be dewatered without impacting operational deliveries. Repair activities can take place anytime based on unanticipated failures of levees, canal banks, gates, weirs, pipelines, or valves. An at-grade HST alignment will prevent all vehicles from moving along waterway banks or levees. When maintenance activities require heavy earthmoving equipment (including excavators, or other track equipment) to cross the HST alignment at the nearest grade separation additional cost may be incurred if the heavy equipment requires a prime mover and trailer.

For heavy, earthmoving equipment, unrestricted access along a conveyance system would require significant clearance above ground level (e.g. Kings River Conservation District prefers 18 feet for the operation of such equipment although lesser clearance may be acceptable through further discussion). Lining the canal or ditch can minimize the need for work directly under the structure. Likewise, the insertion of a box culvert, siphon, or pipeline segment encased in concrete under the HST alignment can minimize the need for frequent maintenance and repair. These requirements would be included in Master Agreements. These would be the preferred solutions to water conveyance crossings under at-grade HST alignments. The design team intends to extend box culverts and pipelines beyond the limits of the HST right-of-way fencing to allow vehicles to turn around and cross the canal or ditch.

Impacts caused by the HST alignment to maintenance and repair of irrigation facilities on a property owner's adjacent field, orchard, or vineyard will likely be similar though smaller in scope because of the size and nature of the irrigation facilities involved. These impacts are addressed through the Right of Way acquisition process.

## CONCLUSION

Water supply and delivery systems are critical to agricultural production and to the economy of the San Joaquin Valley.

The HST project will encounter an individual irrigation system on virtually every significant agricultural parcel in the Valley.

While water supply and delivery systems can be complex, engineered solutions are available to the designers. Systems can be modified, crossings can be designed, access can be provided, operations can be accommodated and maintenance can be supported through careful planning, competent design, and appropriate consultation.

Construction work should be scheduled so no water supply to viable farmland will be cut off or permanently disrupted or as otherwise agreed to prior to construction.

Any needed modifications to existing irrigation systems for individual farming operations are part of the HST right of way acquisition process.

All aspects of design, construction, operations, maintenance and repair activities will be covered in a Master Agreement with each water or resource agency.

Provisions for utility crossings should be incorporated into the initial construction of future systems. An example would be providing an empty 24" casing along existing county road alignments where irrigations pipes could be installed through at a later time.

Reviewer noted that due to advancements in water delivery technology there are opportunities created to modernize and increase efficiencies to existing systems. While this is outside the scope of this white paper and direct control of the Authority control, the working group agrees that such upgrades would

work to mitigate impacts. An example would be automated or remote activated systems would reduce the need to reach areas with limited access as a result of the HSR alignment.

## REFERENCES

HSR project meetings with valley Ditch and Canal Companies, Irrigation and Flood Control Districts  
and Kings River Conservation District

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS) Best  
Management Practices <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/home> or

[http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/technical/alphabetical/ncps/?&cid=nrcs143\\_026849](http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/technical/alphabetical/ncps/?&cid=nrcs143_026849)